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(71) Applicant: **Sumitomo Wiring Systems, Ltd.**
Yokkaichi-City, Mie, 510-8503 (JP)

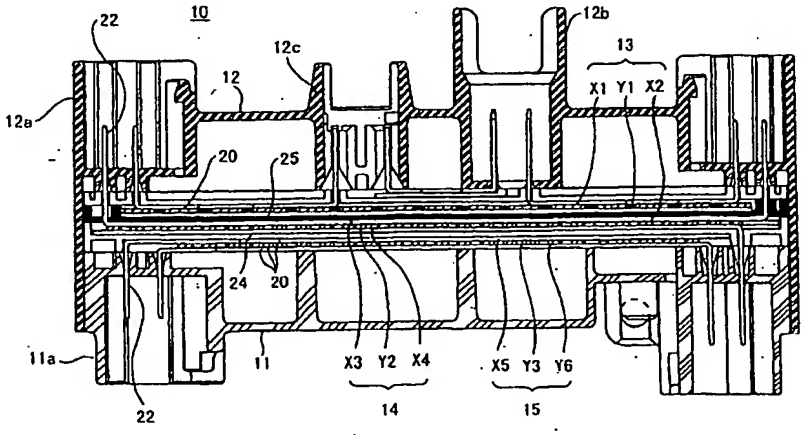
(72) Inventor: **Oka, Yoshito**
1-14 Nishisuehiro-cho Yokkaichi-ken, Mie (JP)

(74) Representative: **Uchida, Kenji et al**
S.A. Fedit-Loriot et Autres Conseils en Propriété Industrielle,
38, avenue Hoche
75008 Paris (FR)

(54) Electrical connector housing

(57) The internal circuits of an electrical connector housing (10) are formed in a simplified way. The electrical connector housing (10) comprises at least one case (11, 12) including one or more outwardly projecting connector-, fuse- and/or relay-fitting portions. The housing case (11, 12) comprises a plurality of circuit blocks, each of which includes at least one X-directional bus bar layer (X1 to X6) and at least one Y-directional bus bar layer (Y1 to Y3) superposed thereon. The X-directional and Y-directional bus bar layers contain strip-shaped bus bars (20) and an insulator sheet or film (21) coated thereon. The strip-shaped bus bars (20) are arranged in parallel at a given interval, respectively in an X direction and in a Y direction perpendicular thereto. The plurality of circuit blocks are then superposed on one another with an insulator sheet (24, 25) interposed therebetween, such that the bus bars (20) arranged in the X and Y directions form cross points (P). The cross points (P) are electrically connected to circuits at desired cross points (P) so as to form branched circuits. The bus bars (20) in the X and Y directions have folded end portions to form tabs (22), and the tabs (22) are contained in the connector-, fuse- and/or relay-fitting portions (11a, 12a, 12b, 12c).

FIG.2



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Description

[0001] The present invention relates to an electrical connector housing used in automobiles. More particularly, the invention concerns bus bars used as internal circuits of the electrical connector housing. According to the invention, these bus bars are manufactured in a simple way, without recourse to a traditional method of stamping out circuit-shaped bus bar through a die.

[0002] The internal circuits of an electrical connector housing, such as a junction box used in automobiles, make mainly use of bus bars formed in circuit shapes. Such bus bars are stamped out from an electrically conductive metal sheet through a die. Besides the approach involving the use of bus bars, there exists another approach in which electrical cables are wired along circuitry on an insulator sheet, and are then press-connected through press-fit terminals by clamping (press-connection system). These two approaches may also be applied in combination.

[0003] However, recent developments in this field have brought about an increase in the number of electrical parts equipped and the number of circuits used in an electrical connector housing. The shape of insulator sheets or plates used for cable wiring has also become more complex than in the past. Under such circumstances, if the press-connection system is used for wiring the internal circuits, more time and costs will be consumed for cable wiring and insulator-sheet manufacturing.

[0004] If bus bars are used for internal circuits, respective stamping dies have to be prepared for the different circuits produced. Under such conditions, circuit changes will not be responded to as quickly as desired. In addition, the die manufacturing processes incur high costs. Moreover, as the stamping process leaves important portions of unused sheet, the product yield of a conductive metal sheet will be considerably low. As a result, the manufacturing cost of the bus bars is relatively high. Further, as the number of circuits used in an electrical connector housing increases, the number of bus bars required also increases. Nowadays, seven or eight pieces of bus bars must sometimes be superposed in multiple layers. At the same time, corresponding insulator sheets or plates must be interposed therebetween. Such a structural feature therefore tends to increase the total costs.

[0005] In view of the above problem, a circuit sheet 2 shown in Figs. 1A and 1B has been used to implement an electrical connector housing (Japanese Patent Application published under SHO 56-130989). According to the disclosure in this patent application, a conductive metal sheet is stamped out so as to yield cut-off portions 3a and a checkered conductive sheet 3. Two faces of the checkered conductive sheet 3 are then laminated with insulator sheets 1a and 1b. Thereafter, unnecessary circuit paths 3b are cut off so as to form a desired circuit. The checkered conductive sheet 3 is then encircled by electrical cables, and led to external circuits.

[0006] As a circuit is formed by cutting off unnecessary circuit paths 3b, the circuit can be modified quickly. However, as checkered circuits are formed by stamping, i.e. by removing many cut-off portions 3a, the product yield from the conductive metal sheet is rather low. Further, an electrical connector housing, e.g. a car junction box, requires many circuits such as power-source circuits located upstream of the fuses, load circuits located downstream of the fuses, and circuits unconnected to the fuses. Consequently, the number of bus bar layers becomes large, thereby increasing production costs.

[0007] In view of the above, a first object of the invention is to provide an electrical connector housing in which circuits can be formed by unit blocks. A second object of the invention is to reduce the costs of forming internal circuits. A third object of the invention is to be able to respond quickly to changes of internal circuits.

[0008] To this end, there is provided an electrical connector housing comprising at least one housing case including one or more outwardly projecting connector-, fuse- and/or relay-fitting portions. The at least one housing case comprises a plurality of circuit blocks, each of the circuit blocks including at least one X-directional bus bar layer and at least one Y-directional bus bar layer superposed thereon. The X-directional and Y-directional bus bar layers contain strip-shaped bus bars and an insulator sheet or film coated thereon. The strip-shaped bus bars are arranged in parallel at a given interval, respectively in X direction and Y direction perpendicular thereto. The plurality of circuit blocks are then superposed to one another with an insulator plate interposed therebetween, such that the bus bars arranged in the X and Y directions form cross points. The circuit blocks are then electrically connected to each other at desired cross points so as to form branched circuits, whilst the bus bars in the X and Y directions have bent end portions to form tabs, and the tabs are contained in the connector-, fuse- and/or relay-fitting portions.

[0009] In the bus bars arranged respectively in the X and y directions, required circuits are formed by removing unnecessary paths in the circuits. In such a structure, strip-shaped bus bars having a given size can be used for both the X and Y directions. The bus bars can thus be prepared uniformly, and production costs can be reduced.

[0010] As the electrically conducting portions constituting the internal circuits are all made of strip-shaped bus bars, a common material can be used. The efficiency in the use of material and yield are thus improved. Further, the stamping process using dies, hitherto necessary for making bus bars, can be obviated, thereby greatly reducing circuit-production costs.

[0011] The strip-shaped bus bars are arranged in parallel, at a given pitch, in X and Y directions. This pitch can be chosen such as to correspond to the pitch between the terminal holes for the connector, fuse or relay. For instance, some of the bus bars arranged in parallel in the X direction are disposed such as to correspond to

the pitch between the fuses, whilst the rest thereof is disposed such as to correspond to the pitch between the relays. Likewise, some of the bus bars arranged in parallel in the Y direction, perpendicular to the X direction, are disposed such as to correspond to a small pitch between the connector terminal holes, while some other bus bars are disposed such as to correspond to a median pitch, and the rest of the bus bars is disposed such as to correspond to a large pitch.

[0012] When the bus bars are arranged crosswise in the X and Y directions at a pitch corresponding to that between the terminal holes of the connectors, fuses and relays, the tabs formed by folding these bus bars can be connected to the connectors, fuses and/or relays directly.

[0013] When the X-directional layer and the Y-directional layer, respectively including strip-shaped bus bars, are superposed to form more than two layers, desired circuit blocks can be formed preliminarily in a simple way. By changing the combination of blocks or combinations inside a block, circuits can be changed easily. Further, when the circuits are formed by blocks, the strip-shaped bus bars can be designed to have the same width, as a function of required current intensities. The circuits can thus be formed simply as a unit of block. Furthermore, the circuits can be assembled by block in the electrical connector housing, so that the assembly efficiency can be improved.

[0014] The plurality of circuit blocks include one or more power-source circuit blocks located upstream of the fuses, one or more load-circuit blocks located downstream of the fuses and one or more splice-circuit blocks unconnected to the fuses. Further, the bus bars of the power-source circuit block(s), those of the load-circuit block(s) and those of the splice-circuit block(s) have, respectively, a broad width directed for strong current circuit, a median width directed for median current circuit, and a narrow width directed for weak or mini current circuit.

[0015] Accordingly, a power-source-circuit block, a load-circuit block and a splice-circuit block are formed by combining the X-directional bus bar layer and the Y-directional bus bar layer. A required circuit can thus be formed simply by assembling these blocks.

[0016] The bus bars have first and second faces laminated with a respective insulator resin film. The bus bars, arranged respectively in the X and Y directions, are connected to each other by riveting or welding at the cross points. The bus bars contained in different blocks are then connected to one another by interposing a pin with two edges in a position perpendicular to the bus bars, and welding the two edges thereto.

[0017] As the bus bars are coated with insulator resins, there is no need to interpose an insulator sheet between the X-directional and the Y-directional bus bar layers. Accordingly, when the blocks are mounted in the electrical connector housing, only the zones between the blocks are to be interposed with an insulator sheet. Compared to the past practice in which all the bus bar layers are interposed by an insulator sheet, the present invention enables the number of insulator sheets or plates to be reduced. As a result, costs are reduced, and the electrical connector housing can be miniaturized.

[0018] The above and the other objects, features and advantages will be made apparent from the following description of the preferred embodiments, given as non-limiting examples, with reference to the accompanying drawings, in which:

Figs.1A is a partially exploded perspective view of an electrical circuit coated with insulator sheets or plates according to a prior art;
Fig.1B is a top plan view of the electrical circuit of Fig.1A when unnecessary paths are cut off;
Fig.2 is a cross-sectional side view of the electrical connector housing according to the invention;
Fig.3 is a partially exposed top plan view of the electrical connector housing of Fig.2;
Fig.4A and 4B are respectively a perspective view and a cross-sectional view of a bus bar;
Fig.5A is an exploded perspective view of a circuit block consisting of X-directional and Y-directional bus bar layers;
Fig.5B is a cross-sectional view of the circuit block of Fig.5A when they are assembled and electrically connected;
Fig.6 is a schematic view showing how the bus bars are connected between different circuit blocks;
Fig.7 is a perspective view of a variant bus bar arrangement according to the invention, where the X-directional bus bars and the Y-directional bus bars are interposed by an insulator sheet with connecting holes.

[0019] As shown in Fig.2, an electrical connector housing 10 such as a junction box is comprised of a lower housing case 11 and an upper housing case 12, and contains internal circuits formed of strip-shaped bus bars 20.

[0020] The bus bars 20 form, for example, X-directional bus bar layers X1 to X6 in which the bus bars 20 are arranged in parallel at a given interval along the X direction, and Y-directional bus bar layers Y1 to Y3 in which the bus bars 20 are likewise arranged along the Y direction. The X-directional bus bar layers X1 and X2 flank the Y-directional bus bar layer Y1 by their two faces, thereby forming a power-source circuit block 13 consisting of the three layers X1-Y1-X2. Likewise, the X-directional bus bar layers X3 and X4 flank the Y-directional bus bar layer Y2 by their two faces, thereby forming a load-circuit block 14 consisting of the three layers X3-Y2-X4. Further, the X-directional bus bar layers X5 and X6 flank the Y-directional bus bar layer Y3 by their two faces, thereby forming a splice block 15 consisting of the three layers X5-Y3-X6.

[0021] Both faces of each bus bar 20 are laminated

with insulator resin sheets or films 21, except its end portion which is exposed and folded to form a tab 22 (Fig.4A). A plurality of bus bars 20 included in one of the X-directional bus bar layers X1 to X6 and the Y-directional bus bar layers Y1 to Y3 have length-side end portions bonded to carriers. In this state, the X-directional bus bar layers are superposed on the Y-directional bus bar layers, such that the bus bars 20 are arranged in crosswise directions. The cross points P to be connected are clamped by rivets 17 so as to form branched circuits (Fig.5B). After connection, unnecessary points are removed. Accordingly, the X-directional bus bar layers and the Y-directional bus bar layers can be superposed without an insulator sheet being interposed. Instead, the insulator sheet is interposed only between the circuit blocks.

[0022] The bus bars 20 inserted in one of the X- and Y- directional bus bar layers X1 to X6 and Y1 to Y3 have a specific width: the bus bars used in the power-source circuit block 13 have a broad width so as to form a high current circuit. Those used in the load-circuit block 14 have a median width so as to form a median current circuit. Those used in the splice-circuit block 15 have a narrow width so as to form a weak or mini current circuit.

[0023] In the above construction, a splice-circuit block 15, a first insulator sheet 24, a load-circuit block 14, a second insulator sheet 25 and a power-source-circuit block 13 are successively mounted on the lower housing case 11 in that order.

[0024] When the bus bars 20 of different circuit blocks are to be connected, a pin 23 made of a conductive metal is provided, and both of its ends are connected to the bus bars 20 by welding (Fig.6).

[0025] As shown in Fig.2, the lower housing case 11 is provided with first connector-fitting portions 11a whereas the upper housing case 12 is provided with second connector-fitting portions 12a, a fuse-fitting portion 12b and a relay-fitting portion 12c. The connectors, fuse and relay (not shown in the figures), fitting to the above fitting portions, have their terminals arranged at a given pitch. The bus bars 20 are therefore positioned such that their intervals in the X-direction and in the Y-direction correspond to the above pitch. In this manner, the tabs 22 projecting from the bus bars 20 are positioned such as to correspond to the terminal holes of the connectors, fuse and relay.

[0026] When mounting the electrical connector housing 10, the preliminarily formed splice-circuit block 15, load-circuit block 14 and power-source-circuit block 13 are successively superposed on the lower housing case 11, with the interposition of the first insulator sheet 24 and the second insulator sheet 25 between the corresponding circuit blocks. The upper housing case 12 is then placed over this assembly. At the same time, the tabs 22 formed on the bus bars 20 are inserted into the connector-, fuse- and relay-fitting portions.

[0027] In the above construction, the circuits are preliminarily prepared as circuit blocks, such as power-source circuit blocks 13, load-circuit blocks 14 and splice-circuit blocks 15. When an electrical connector housing requiring a high-intensity circuit, e.g. a junction block, is to be constructed, it suffices to assemble these circuit blocks successively in electrical connector housing cases. The assembly efficiency is thus high. Further, when a circuit has to be changed, only the circuit block including the modified circuit needs to be changed. Circuits are thus easily changed. Furthermore, in the X-directional and Y-directional bus bar layers in the same block, the bus bars that are laid out may have the same width. Each circuit block can thus be composed of the bus bars securing a similar electric current intensity flow.

[0028] However, the present invention is not limited to the particulars described above. The bus bars may be bonded to one another by welding, instead of riveting. Likewise, instead of laminating the surfaces of each bus bar with insulator sheets, the X-directional bus bars and the Y-directional bus bars may be arranged in crosswise directions on each face of an insulator sheet or plate 30 (Fig.7). In such a case, the insulator sheet may be provided with openings at the cross points where connections are made. The upper and lower bus bars are then bonded by resistance welding. In the case of three layers X-Y-X, the latter are bonded in pairs of layers by resistance welding.

[0029] As described above, the internal circuits of the electrical connector housing contain X-directional bus bar layers in which strip-shaped bus bars are arranged in parallel at a given interval in the X direction, and Y-directional bus bar layers in which strip-shaped bus bars are likewise arranged in the Y direction. The X-directional and Y-directional bus bar layers are then superposed, such that the bus bars in each layer are arranged in crosswise direction to each other. The above layers then form a power-source circuit block, a load-circuit block, a splice-circuit block, etc.. These circuit blocks are thus easily formed. Further, when some circuits are to be included into the circuit blocks, it suffices to change the connecting or cut-off positions in the X- or Y-directional bus bars. The circuits can also be changed very easily.

[0030] In a connector housing case, the circuit blocks are superposed with an insulator sheet interposed therebetween. In this manner, high-intensity internal circuits can be formed easily in an electrical connector housing. Moreover, a circuit configuration can easily be modified by changing circuit blocks to be assembled.

Claims

1. An electrical connector housing (10) comprising at least one housing case (11, 12) including one or more outwardly projecting connector-, fuse- and/or relay-fitting portions (11a, 12a, 12b, 12c), said at least one housing case (11, 12), characterised in that said electrical connector housing (10) comprises a plurality of circuit blocks, each of said circuit

blocks including at least one X-directional bus bar layer (X1 to X6) and at least one Y-directional bus bar layer (Y1 to Y3) superposed thereon, said X-directional and Y-directional bus bar layers contain strip-shaped bus bars (20) and an insulator sheet (21) coated thereon, said strip-shaped bus bars (20) being arranged in parallel at a given interval, respectively in an X direction and in a Y direction perpendicular thereto, said plurality of circuit blocks are superposed on one another with interposition of an insulator plate (24, 25) therebetween such that said bus bars (20) arranged in said X and Y directions form cross points (P), said circuit blocks are electrically connected to each other at desired cross points so as to form branched circuits, said bus bars (20) in said X and Y directions have bent end portions to form tabs (22), and said tabs (22) are contained in said connector-, fuse- and/or relay-fitting portions (11a, 12a, 12b, 12c).

2. The electrical connector housing (10) according to claim 1, wherein said plurality of circuit blocks include one or more power-source circuit blocks (13) located upstream of fuses, one or more load-circuit blocks (14) located downstream of said fuses and one or more splice-circuit blocks (15) unconnected to said fuses, and wherein said bus bars of said power-source circuit block(s) have a broad width directed for high current circuitry, said bus bars of said load-circuit block(s) have a median width directed for median current circuitry, and said bus bars of said splice-circuit block(s) have a narrow width directed for weak or mini current circuitry.

3. The electrical connector housing according to claim 1 or 2, wherein said bus bars (20) have first and second faces laminated with a respective insulator resin sheet (21), wherein said bus bars (20) arranged respectively in said X and Y directions are connected to each other by riveting or welding at said cross points (P), and bus bars (20) contained in different blocks are connected to one another by interposition of a pin (23) with two edges in a position perpendicular to said bus bars (20), and welding said two edges thereto.

FIG.1 A PRIOR ART

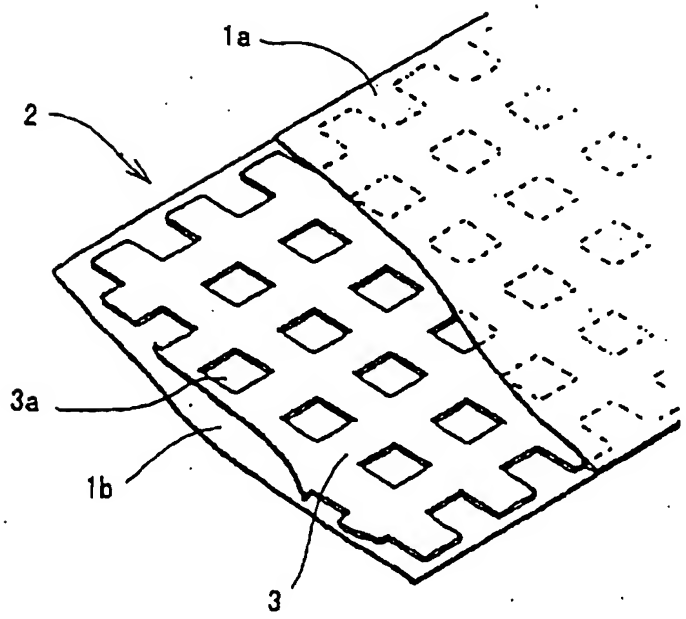


FIG.1 B PRIOR ART

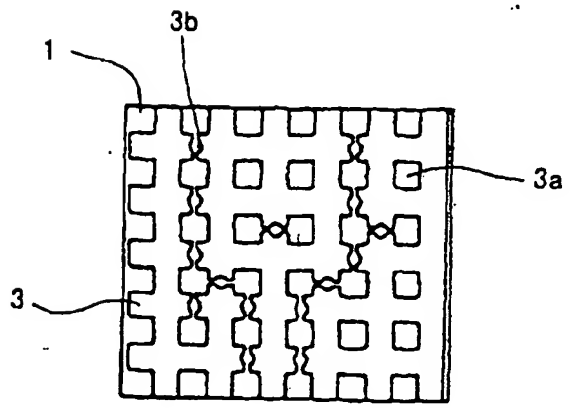


FIG.2

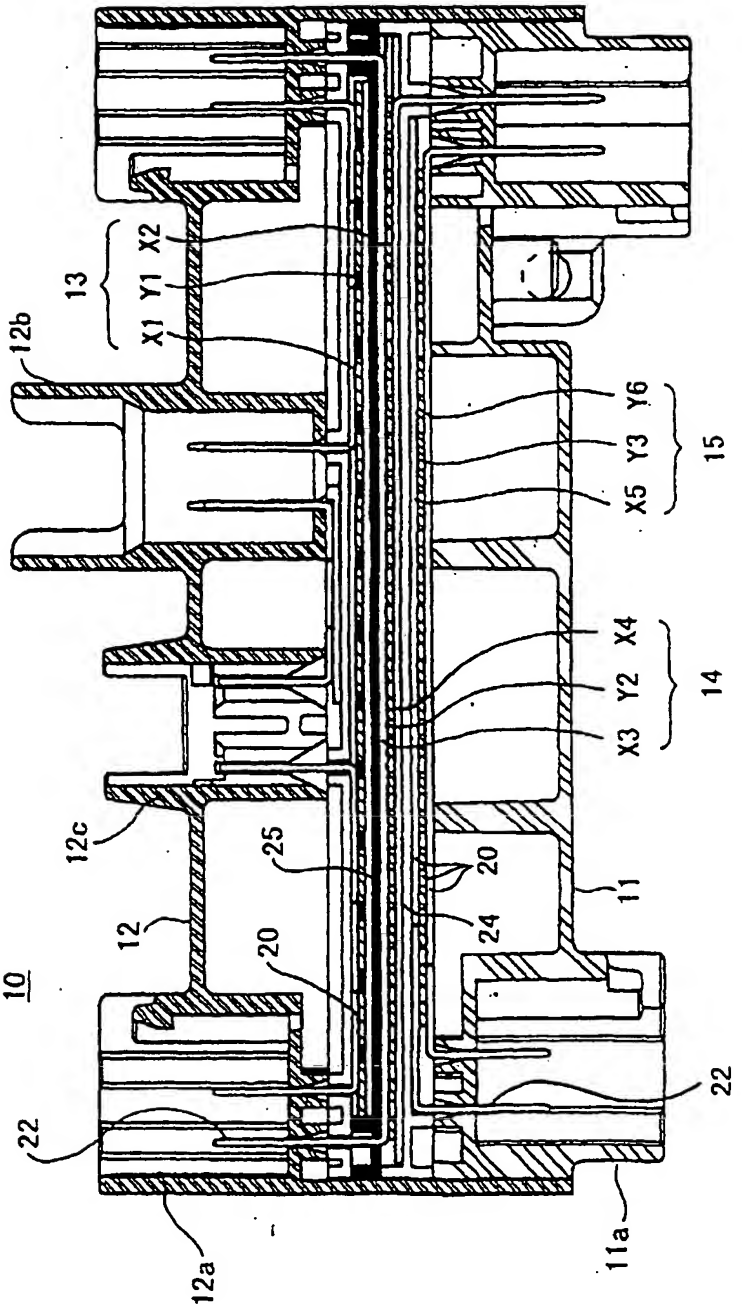

10
11
11a
12
12a
12b
12c
13
14
15
20
22
24
25
X1
Y1
X2
X3
Y2
X4
X5
Y3
Y6

FIG.3

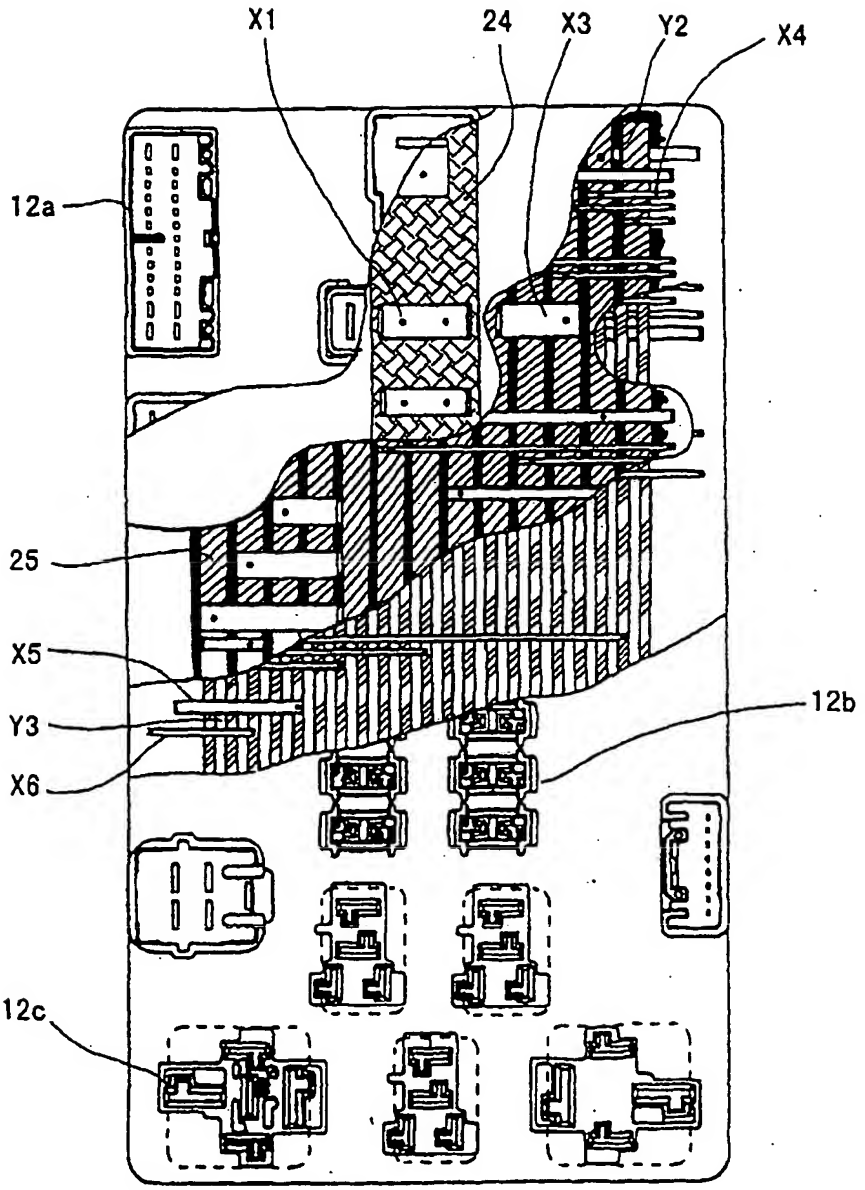


FIG.4 A

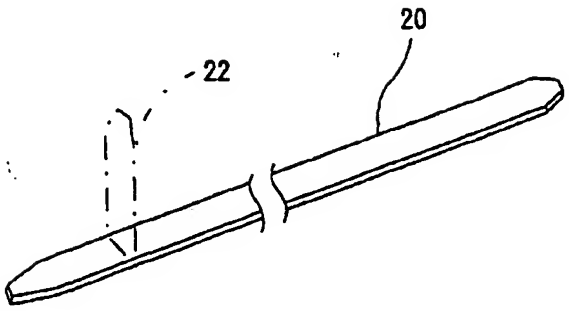


FIG.4 B

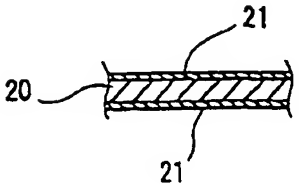


FIG.5 A

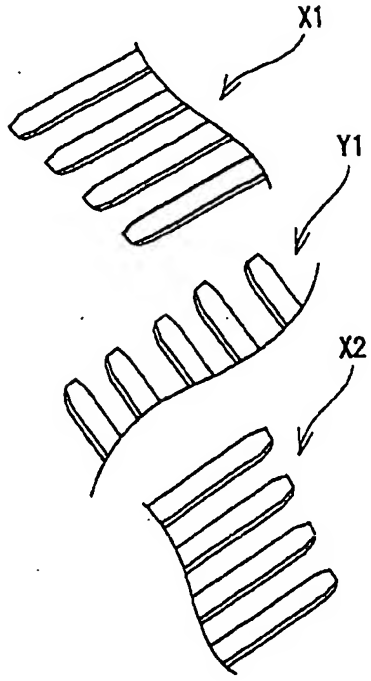


FIG.5 B

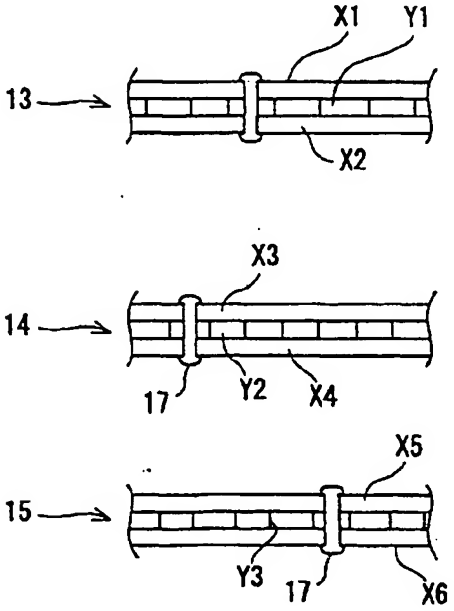


FIG.6

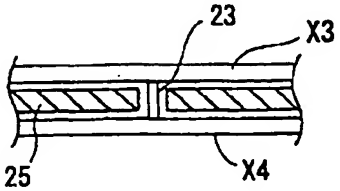
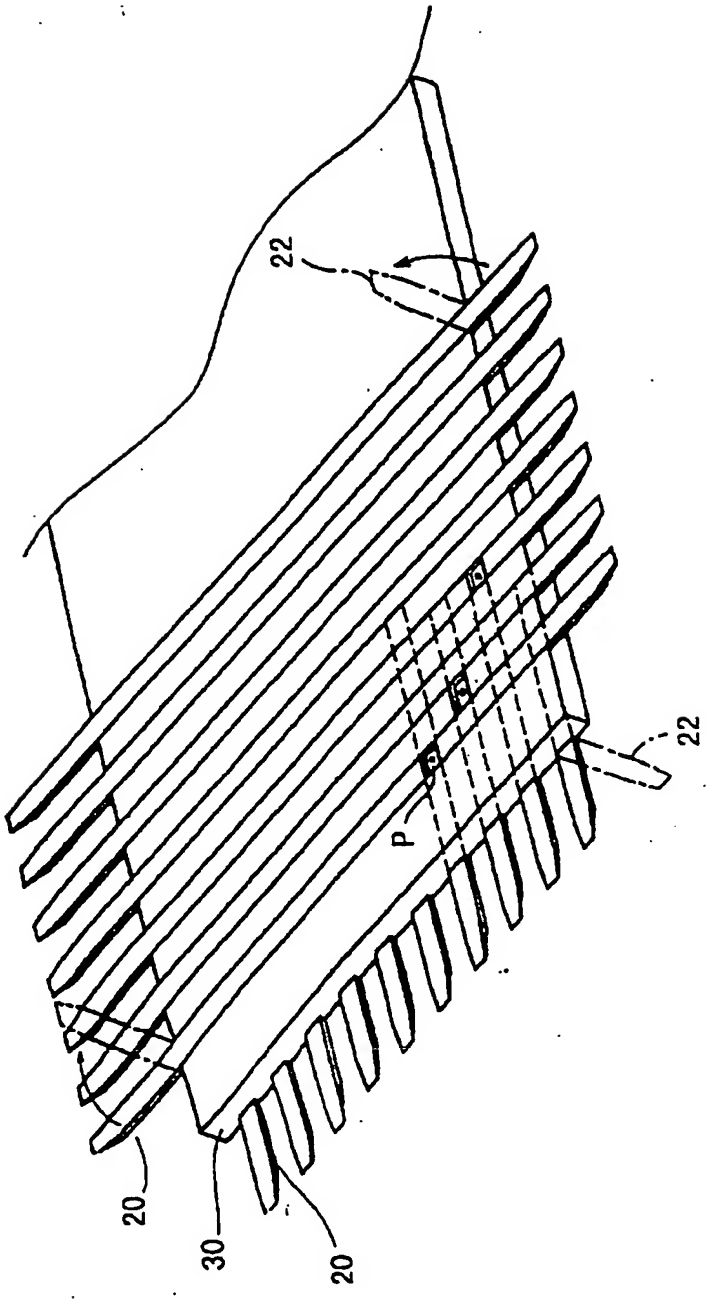


FIG.7



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EUROPEAN SEARCH REPORT

Application Number
EP 00 40 2170

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A	EP 0 926 934 A (DELPHI) 30 June 1999 (1999-06-30) * column 1, line 26 - line 46; figures 1-3 *	3	
A	EP 0 445 759 A (FUJITSU) 11 September 1991 (1991-09-11) * column 3, line 3 - line 51; figure 2 *	3	
A	EP 0 259 897 A (SUMITOMO) 16 March 1988 (1988-03-16) * column 3, line 32 - line 43 * * column 4, line 23 - line 40; figures 1,3 *	1	TECHNICAL FIELDS SEARCHED (Int.Cl.7) H01R H05K

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	9 November 2000	Alexatos, G

CATEGORY OF CITED DOCUMENTS

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